USER UNDERSTANDING OF IS NEEDS AND EXPECTATIONS:

IMPACT ON QUALITY OF REQUIREMENTS

AND SATISFACTION WITH SYSTEM

by
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ABSTRACT

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This paper explores the effect of users' knowledge of system design methodologies, vocabulary and processes on the ability of the analysts and designers to gather information needed for the development of a system that meets the users' expectations. It investigates whether gaps in users' knowledge of the system design process contribute to a breakdown in communication among designers and users and if so, what can be done to avoid it, and what the breakdowns mean to the overall success of the project. A system implementation project in a corporate environment was selected as the focus of this study. Users of the system and the IS team involved in the implementation were interviewed after the project had been completed for their experiences and perceptions with respect to communication of expectations and education on design methods. Key findings include the impact of previous experience on the users' comfort level with the requirements gathering process and the effects of a changing communications flow during requirements gathering.

Headings:

Communication

Participatory Design

System Design – Methodology

User Involvement

User Participation

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1. INTRODUCTION: PROBLEM STATEMENT

***Research Question**: "Does the education of users in system design methodology increase the quality of requirements collected and the satisfaction of the users with the system upon implementation?"*

As our world becomes more reliant on information systems to store, manipulate and transport data, the methodologies used for design and development rely heavily on user input. The requirements and product specifications are often defined with users from the beginning and verified with users throughout the design process. However, requirements gathering with user involvement does not necessarily guarantee that the final product will meet the users' needs, nor does it ensure a harmonious and productive relationship between the development organization and the client. Often, discord comes as a product of mismatched expectations and results.

Design methodologies have faced this challenge of miscommunication by recommending that the designer/developers spend time learning and understanding the users' business as part of the requirements gathering process. This approach certainly is a step toward bridging the communication gap; however, for the designers to understand the users is only half the battle. Users, although "involved" in requirements definition, still have a largely passive role in these activities. The systems analysts and designers probe, document, and verify the users' needs, while the clients provide the context and

specifications. Unfortunately, the users are often not familiar with the methodologies used by the designers, and may not understand what they are being asked to provide. Do the users know what is meant by "requirements analysis," "product specifications" or "JAD/RAD?" At best, a vague idea of the meanings and implications of the terminology is probably all the users have to frame discussions with the analysts and designers.

This paper will explore the effect of users' knowledge of system design methodologies, vocabulary and processes on the ability of the analysts and designers to gather the information needed for development of a system that meets the users' expectations. It investigates whether gaps in users' knowledge of the system design process contribute to a breakdown in communication among designers and users and if so, what can be done to avoid it, and what the breakdowns mean to the overall success of the project. This study provides insights concerning the relationship between user knowledge of design methodologies and user satisfaction with the final system.

2. LITERATURE REVIEW

An investigation of system design methodologies reveals that user involvement in the design process has become an important component in effective design, development and implementation. Systems designers are encouraged to embrace the tools and recipes for gathering pertinent user information, to "Listen well. Ask questions. Understand the business" (Marion & Marion, 1998, p. 11), to analyze the data collected, and to incorporate it into the overall design requirements and specifications documentation. The underlying theory of these methodologies is that participation by the users increases the accuracy of the system requirements and objectives, as well as user acceptance and system effectiveness. Flavors of participatory design methods are plentiful, and approach understanding the users' needs in a variety of ways. Here, several methods will be briefly reviewed to provide a background for further discussion.

Enid Mumford's ETHICS method has a set of primary objectives related to the involvement of the users. These are: (a) to provide the users of the system with the opportunity to participate in the design of it, (b) to ensure user acceptance through maximized efficiency and job satisfaction, and (c) to encourage users to "own" their organizational environment and changes within it (Mumford, 1995). The ETHICS method proposes that designers work with users in order to define requirements, satisfaction criteria, and potential issues. Users are tasked with identification of mission, tasks, needs, and objectives to create a complete picture of the expectations for the system

(Mumford, 1995). The ETHICS methodology provides users with some exposure to design tasks as they define their needs, but this learning is largely embedded in the experience, and there is no mention of a more formal introduction for users to design and development theories and phases.

The JAD (Joint Application Design) method also requires user-designer interaction. JAD "sessions" are meetings between users and developers to define business and system requirements, processes and user needs. Initial research into user requirements and the users' work environments is performed in order to ensure that important issues can be addressed during the sessions (Wood & Silver, 1995). Like ETHICS, the objectives of this approach center around data gathering and opening communication channels between the users and designers. JAD attempts to avoid some traditional requirements definition problems such as limited user input, unverified assumptions and second-hand communication by getting the appropriate users and designers together for several days of intensive work.

JAD, ETHICS, and other participatory design methods rely heavily on the role of a facilitator to act as an intermediary who steers the information gathering in an unbiased and impartial manner. JAD proposes structured processes around the gathering of requirements information while participatory design utilizes a more flexible approach (Carmel, et al., 1993). After the user data is collected, it is integrated into system requirements and documentation by Information Systems (IS). Wood and Silver's (1995) book on JAD gives the facilitator and participant designers some hints on potential pitfalls in JAD sessions. These pitfalls include the use of technical jargon, and overuse of design

and development tools and language such as ER diagrams and process models. Because users generally do not have much grounding in these areas and tools, it is difficult for them to participate in such conversations in a productive manner. Although they do not state it explicitly in their warnings around "JAD Busters," Wood and Silver's (1995) message is clear: designer/developers should refrain from IS specialized terminology and specialized IS work practices, and sit down and listen to the users.

All of the participatory methods, by definition, include the user in the design process, and it is recognized that there is a potential for two way learning (Allison, et al., 1992). Systems designers use participatory design to understand the users, their business, and their needs. Users "participate" by explaining their business and needs, but they are not offered or asked to understand the needs of IS during the design process.

Obviously, communication and learning are key elements in participatory design. Sonnenwald (1993, 1995, 1996) defined a number of roles which delineate how communication is managed across and within organizational boundaries during different phases of the design process. Sonnenwald's communication model presents the idea that users and developers involved in design activities need to be able "to mutually explore one another's life-worlds," (Sonnenwald, 1993, p. 180) while at the same time enhance their understanding of their own. This dual focus - inward and outward - lies at the heart of "contested collaboration," (Sonnenwald, 1993, p. 180) causing difficulty in communication between the groups. These learning activities are generally separated in time and by audience - designers learn about the users in the beginning of the design process, while users learn the system at the end of the process (Bertaggia, et al., 1992).

Between these events, the designers and developers are working to make the requirements a reality, and the users are typically left to wonder what comes next. It is suggested that prototyping can be used to calm the nerves of anxious, uninformed users by reassuring them that the project is proceeding and the "product" is evolving (Bosser & Melchior, 1992).

Communication can be limited in other ways, though. As mentioned earlier in this review, the use of technical language and concepts can hinder cooperation in development phases (Raymont & Nolan, 1985), effectively barring users uneducated in design and development terms and theories from participating in valuable discussions. These tactics, intentional or not, have the impact of distancing users from the designers and preventing participation, confirming the views of the designers "from their monopolistic position, that the users do not want…the users are not capable…the users do not understand…" (Briefs, 1985, p. 5). It is important that users and designers share a "common knowledge of the activities in software development to understand each other and to cooperate without undue friction" (Sack, 1985, p. 79). Sack goes on to propose that training for users on design practices is appropriate and necessary for true cooperation and communication to occur between IS personnel and the user.

By educating users in aspects of IS design and development, they may become full participants, rather than objects of observation and probing by the design and development team. As a result, users can become involved in activities which are not traditionally part of their roles in the design/development process. User participation could even include

some physical design and programming (Cotterman, 1985). Full participation may lead to a more effective IS design and implementation process.

In many cases, this advanced level of involvement may not require significant additional training for the users due to their existing knowledge and innate understanding of design principles. Users participate in the adaptation of "systems" regularly in order to meet their needs, and so, have an informal baseline knowledge of what is needed for successful development. Other examples include users who have considerable knowledge of programming and can effectively debate with IS on programming issues (Clement & Halonen, 1998). Even though it may create conflict when users have some background and understanding of systems development processes, they may be able to contribute more to discussions about the system requirements and implementation plans, and better evaluate the solutions proposed by the designers.

In conclusion, user participation in design is a widely accepted requirements gathering practice. Literature on user involvement and specific methodologies related to user involvement is plentiful. What is lacking in the literature related to user participation in design is exactly how to ensure that the users are participating as effectively and completely as possible. The development of communications models, such as that defined by Sonnenwald (1993), take the concept of user involvement farther by identifying the roles within a design project, how those roles contribute to the communication during design and their impact on the design process. However, users' understanding of their roles and what is expected of them during requirements gathering must be examined

further to more fully explore the potential for breakdowns in communication and their effect on the requirements gathering process.

3. RESEARCH METHODOLOGY

3.1 OVERVIEW

In order to research the relationship between users' understanding of system design and the final level of satisfaction with the system, the ideal methodology would be to observe activities in a design and development project from start to finish, and interview design participants throughout the course of the project. This method would allow for collection of information on educational interventions, the users' level of knowledge, documentation of perceived obstacles, and the users' satisfaction with the final result as the design and development process unfolded. Unfortunately, because design and development projects can last from many months to several years, time restrictions prevent the real time observation of a design/development cycle from start to finish and the interviewing of participants during their involvement. Instead, data was collected through interviews of users and designers regarding their participation and experiences in a development project that was recently completed.

It is recognized that this methodology was subject to interviewees' lapses in memory and other pitfalls associated with the passage of time and recalled information. However, because the project was recently completed and study participants were asked about critical incidents and their perspectives, the data sources and study participants were able to provide sufficient information to investigate the impact of users' knowledge of system design methodologies on their satisfaction with the final product. Additional

discussion on the challenges of this methodology can be found in the “Limitations” section later in this paper.

3.2 RESEARCH SETTING AND STUDY PARTICIPANTS

The study participants for this research were selected based on their participation in an implementation project that began in January 1998 and was completed in April, 1999. In the requirement stages of this project (April through December, 1998), a “user team” and a “development team” were defined. Although there were varying degrees of involvement from individuals on both teams, a realistic view of the project from both perspectives could be assessed by interviewing several of each team’s members.

The project was supposed to have a substantial impact on the processes and functioning of an organization in a large international corporation. The organization's corporate employee training consisted of approximately one hundred people located throughout the United States and Canada. The focus of this project was a third party software system that would be linked to existing corporate systems for data feeds, inputs, and outputs. Although the system was primarily developed before this project began, the system's implementation in this organization required the design and development of interfaces to a variety of existing systems to ensure the functionality required by the users. For this reason, the project can be characterized as a system development or implementation project. It will be referred to as the TS-3 implementation project throughout this paper.

Because of the modest size and complexity of the system implementation effort, the user and developer project teams were small. The user team consisted of two fully

dedicated individuals and several advisory members. The developer team consisted of one project manager, a program manager, a developer and a number of consultants, although the persons filling several of the developer team roles changed several times during the project. For example, the role of IS project manager was shifted at least three times during the three phases of the requirements gathering that will be discussed in this paper.

3.3 DATA COLLECTION

Interviewing the users involved in the requirements phase of the project led to an understanding of their familiarity, or lack thereof, with design and development processes, particularly those employed by the design team. This approach allowed for capture of the perceptions and expectations of the users, providing further insight into their understanding of the tasks required during the requirements phase. The development team was interviewed to collect similar information from an alternate perspective, concentrating on the expectations the development team had for the users and the level of understanding the user had of the design methodologies. It was anticipated that exploration of the experiences of both IS and users with respect to user education would provide insights into the nature of individual expectations in a development project and the impact on the implementation. It was hoped that these insights may be applicable to other design and development situations.

As the study participants were current employees in a large corporate environment, permission to interview the study participants was first sought from the management of the respective teams. Once this permission and Human Subjects Institutional Review Board (IRB) approval had been obtained, each study participant was contacted

individually in person or via phone to request their participation in the study. Upon verbal acceptance of the invitation to participate, the study participant was sent a study consent form which formally confirmed their participation and consent to allow or disallow taping of the interview. The form was reviewed and signed by the study participant, then returned to the author and maintained as a record of consent. (See Appendix A: Study Consent Form.)

The user and development team members were geographically distributed throughout the United States and Canada, making in person interviews difficult to accomplish on a restricted budget and timeframe. In cases where the interviewer and the study participant/interviewee were not co-located or within reasonable driving distance (two hours), or scheduling a face to face interview was problematic, interviews were conducted by phone. Two of the six interviews conducted were done in person, the other four were done over the phone. The disadvantages of phone interview will be discussed more in the 3.5 Limitations section below.

A total of six persons were interviewed - three from the user team and three from the IS team. The interviews lasted from forty-five minutes to two hours, depending on the extent of the interviewee's involvement in the project and the depth of their recollection. Interviews were kept to no more than two hours for three reasons: (a) the number of questions and the detail expected from the subjects was not anticipated to require more than two hours' time; (b) the interviews were conducted outside of normal business, even though all involved, including the interviewer, worked for the same company; and (c) the interviewer was very aware of the workload of the subjects and did not wish to further

impose on their time. Holding to a maximum duration for the interview demonstrated a respect for the interviewees' time and personal schedules.

At the outset of the interview, a brief overview of the study was provided to familiarize the interviewee with the purpose and focus of the interview. This overview typically took no more than five minutes of the two hour time period allotted for the interview. Once the overview had concluded, a set of questions that were created for the development team and the user team was used as an interview guide. The questions for each team were slightly different so that the concept and employment of user education could be examined from each team's perspective. A copy of the questions for each team can be found in Appendix B: Interview Questions/Guide. Each interviewee was asked the same questions as others on their team, but a conversational style was used during the interview, which led to some variation in each interview. This method was selected because the use of a conversational format can help to encourage or facilitate detailed discussion on the interview topics and questions.

3.4 DATA ANALYSIS

Data was collected by interviewer note-taking and/or audio tape-recording, depending on the consent of the study participant. All data collected was transcribed into electronic format for review and analysis by the interviewer. After review of each of the interviewees' responses, key thoughts and comments from each interview were extracted and classified according to their underlying themes or topics. This resulted in a set of themes which were evident in one or more of the interviewees' responses to the interview questions. Supporting quotes from the interviewees were grouped according to the

themes and the relation of the themes to the research question assessed. Of particular interest were themes relating to the education of users by IS, previous user/IS experience which may have served as education before the fact, and the communication patterns between IS and the users that may have impacted the users' understanding of the development process - specifically, requirements gathering.

In order to further explore the information collected, topic memos were created in an effort to present an aggregate view of how the interviewees as a group responded with respect to the individual themes relevant to the research question. Once the topic memos had been developed, additional clarification of the timelines, communication paths, user experience and educational activities was accomplished. This process of refining the interviewee responses to a set of topics, then themes, then to a well defined core of information directly relevant to the research question facilitated the identification of practices and concepts surrounding user education that appeared to affect systems development and implementation.

It is important to recognize that themes determined not directly relevant to the research question were identified, but were not expanded upon here. These themes may have had some impact on the interviewees' experiences during requirements gathering and subsequent system implementation activities, but for the purposes of this research, they have been omitted from the discussion of the results.

3.5 LIMITATIONS

3.5.1 Interviewer Bias

The interviewer was heavily involved with this project as the client project manager beginning in October, 1998. This participation in the project may make an interviewer prone to bias in the selection of questions and the discussions during the interview. However, during the project, the interviewer worked extensively with both the user team and the development team and hence the likelihood of the interviewer biasing the responses of the interviewees was low. To ensure that this did not happen (or that it could be documented if it did), all efforts were made to allow the use of tape-recording during the interviews. These recordings were reviewed specifically for detection of bias or persuasion of the interviewees, i.e., during the transcription of the interviews, efforts were made to detect any interview bias.

3.5.2 Phone Interviews

The distributed geographic locations of the interviewer and interviewees necessitated the use of phone interviews. Unfortunately, use of the phone eliminates observation of the study participant during the interview, so non-verbal cues could not be accurately recorded. The dynamics of conversation are also different on the phone, tending to allow less time for note-taking, as the interviewee cannot see the interviewer's actions. The use of phone interviews could, however, have some advantages in that the non-verbal cues of the interviewer would not be seen by the interviewee. As noted in the preceding section (3.5.1 Interviewer Bias), the interviewer may have been prone to display

bias, perhaps in a non-verbal rather than verbal way. The use of the phone helped to prevent these cues from being transmitted to the interviewee.

Additionally, the phone interview was a usual interactive mechanism for the team members. For example, it was relatively rare that all members of the user or development teams were able to meet in one physical space, and so they frequently interacted using the phone. Hence the use of the phone to discuss the project did not appear to be out of the ordinary for the study participants.

3.5.3 Interviewee Willingness to Critique

As mentioned previously, the interviewer was very involved with the project. It was possible that the interviewees would be uncomfortable conveying negative perspectives to the interviewer, in the interest maintaining a good rapport with the interviewer. To counteract this possibility, the interviewer made it very clear in the overview that honest, unencumbered responses are critical to the success of the project and that the interviewee's feedback can only improve similar implementations. In addition, it is important to mention here that the interviewer had and has no direct impact on the interviewees' current position within the organization (users or developers).

4. RESULTS

The interview questions were designed to solicit responses from the interviewees about their own expectations and their understanding of the expectations of others. From this data, the users' comprehension of the requirements gathering process was analyzed and compared to what the IS team expected for successful requirements gathering. As the facets of the expectations were explored, other areas that clearly impacted the users' and IS's ability to gather requirements effectively emerged.

4.1 ANONYMITY OF INDIVIDUALS, ORGANIZATIONS AND COMPANIES

The employee training groups discussed in the following sections will be referred to as Employee Training Group 1, 2 and 3 or ETG-1, ETG-2 and ETG-3 in order to protect the anonymity of the individuals, organizations and companies involved. The training organization that resulted from the consolidation of the three aforementioned groups will be referred to as ETG-4. The respective systems used by the groups will be referenced as Training System 1, 2, 3 and 3A (TS-1, TS-2, TS-3, and TS-3A), where TS-3 is the system whose implementation is the focal point of this paper and the project it explores. Additionally, the pronouns he and she will be used randomly to refer to the study participants, because reference to the study participants' actual gender could be used to identify the individuals involved.

4.2 PROJECT CONTEXT AND TIMELINE

The company in which the TS-3 implementation was undertaken is a relatively large telecommunications firm with over 70,000 employees. Because of the sizable employee population and the broad array of products and services provided by the company, many training organizations had emerged in the company to meet the educational requirements for both employees and customers. In 1998, the number of distinct training groups working in the corporation had risen to over seventy.

The existence of so many distinct organizations with training as their primary purpose led to questions about how the corporation was providing training to its customers and employees. One component of this question centered around the rationality of so many separate training groups; another focused on the number of tools and systems being used to support the operations.

Several training registration and administration tools were evaluated by a sample of both employee and customer training organizations. In 1997, an application produced by an external third party vendor was selected for implementation in the company's training organizations. One of the larger customer training groups was the first group scheduled to implement the new system, TS-3. The implementation for this organization was completed in the late spring of 1998.

As the implementation for this group was drawing to a close, a new series of implementations were ramping up. This series included the three largest employee training groups in North America, ETG-1, ETG-2 and ETG-3. Both ETG-1 and ETG-2 were

using TS-1 for training registration and administration. ETG-3 was using another system, TS-2. Both systems had been developed internally by the company's IS organizations.

At the time, the biggest visible difference between the two systems was that TS-2 allowed employees to access and manage their own training records, review course information and register for courses online via the company's intranet. TS-1 did not provide this functionality. It should also be noted that TS-1 had also been used by the customer training organization that implemented TS-3 first. This factor played a part in the decision to implement the TS-3 system for ETG-1 and ETG-2 before ETG-3. The hope was that these implementations would be smoother because the IS team had already gained some experience with the initial implementation.

Requirements gathering for the three groups (ETG-1, ETG-2 and ETG-3) began in the spring of 1998, as the initial customer training group implementation was coming to a close. At approximately the same time, plans were being made to consolidate the three employee training organizations, ETG-1, ETG-2 and ETG-3, into one large employee training group. See Figure 1 for a graphical illustration of the project timeline. The requirements gathering and planning activities continued throughout the summer of 1998. In September of that year, the consolidation activities were completed and the three organizations were now all part of Employee Training Group 4 (ETG-4). It soon became clear that it was no longer appropriate to address the requirements for three separate groups, but to focus on the requirements of one large organization.

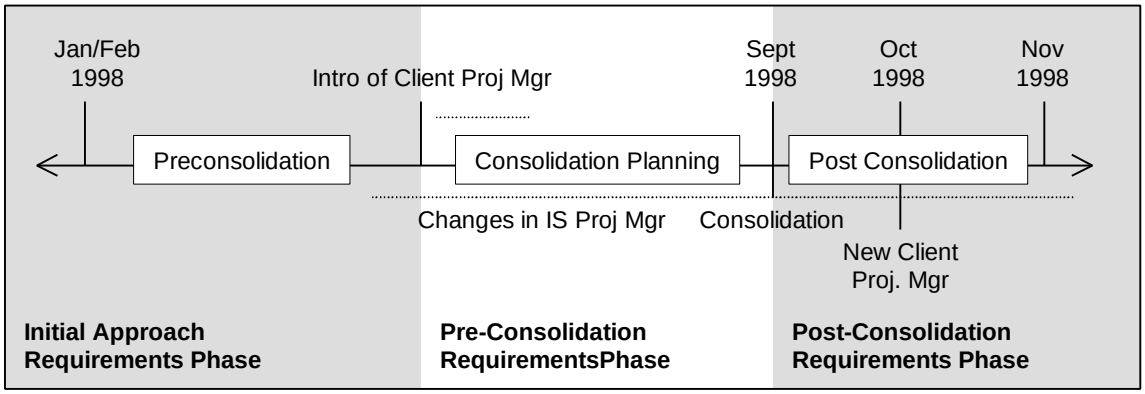

Figure 1: Project Timeline

In November, 1998, several joint applications design (JAD) sessions were held to identify the absolute requirements for ETG-4 organization. ETG-4 "primes", or subject matter experts, were asked to participated in the sessions to provide detailed accounts of the requirements regarding their areas of expertise and ETG-4's business processes.

The interviewees, both user and IS personnel, were involved in the requirements gathering phases of this project at various stages. Some were involved in the original requirements gathering with the three separate groups (Initial Approach Requirements Phase), some were involved in the requirements gathering efforts immediately prior to the consolidation of the three groups (Pre Consolidation Requirements Phase), some were involved in the requirements gathering for the consolidated Employee Training organization (Post Consolidation Requirements Phase), and some were involved in two or all phases.

4.3 PARTICIPANTS' PREVIOUS EXPERIENCE

4.3.1 User Participants' Previous Experience

Of the three users interviewed, only one had prior experience with a system implementation project. This user's experience was similar to the TS-3 project in that the implementation consisted of a third party, "off the shelf" application that would replace a system currently in use by his group and that the system had already been implemented by another larger organization in the company. The user was involved in ensuring accurate data mapping and that the right reports were created to meet the organization's needs.

As preparation for the TS-3 project began in the user's group in early 1998, this user noted that no one had come to request his involvement, even though his expertise in a key area of the business would be valuable. When the user asked about this, he was encouraged to speak with the client project manager for his organization to provide input. The user made notes regarding items that were of concern and questions about functionality and asked to be part of the requirements gathering efforts.

At this point, requirements gathering was just beginning for the three separate organizations. The implementation of the customer training organization (the first group in the company in the company to implement TS-3) was in progress, and the assumption was made and communicated to the user that the system would be able to handle his part of the business. This assumption appears to be based on the notion that the customer training group had similar requirements to the user's organization in his area of expertise.

This user had not been part of the project team from the beginning, but he recognized the value and the importance of his involvement as a knowledgeable user and

sought to become part of the project efforts. By his own accounts, he was not very involved in the initial requirements gathering phase in the spring of 1998, prior to consolidation of the three organizations.

The other two users stated that they had no experience in system implementation prior to this project. Both of these users were confused by the requirements gathering process and how the documentation of requirements would benefit the implementation. One of the users was concerned about

> "this urgency to get all this stuff in. I remember thinking, what was the big deal? Why did you [IS] need it - what were you going to use this for? And I never got an answer because there were just so many different people, so I guess that there was just a misunderstanding of how important it was or why they needed it or were they even using it."

This user also indicated that the requirements gathering was confusing initially, but that she came to understand the importance of the requirements phase as the project progressed.

Another user questioned "why do we need to put a requirements document together - my understanding of the requirements document would be before you purchase the system, you put together the requirements document…" This input indicates that this user had some understanding of the purpose for requirements gathering, but was not able to identify it's role or importance in this project. This user also expressed frustration around the availability of project timelines and how exactly the requirements document fit into the generation of the plans and how they would be used throughout the implementation.

Interestingly, the users who expressed acceptance of the requirements and their importance to the project were the users who had either been involved in similar projects previously or were heavily involved through the completion of the implementation. When asked about his understanding of the importance of requirements gathering, one of the users said, "…but then as the project progressed, I saw how important it was. Probably too late." The user whose attitude was still one of uncertainty around the value of the requirements even after the implementation had no previous system implementation experience, nor was her time dedicated to the implementation. This fact lends credence to the notion that an understanding of the processes used during system design may improve the users' quality of participation and therefore, the quality of the requirements.

4.3.2 IS Participants' Previous Experience

One of the IS interviewees had worked on the requirements gathering for the organization that was first to implement TS-3 in the company. This interviewee approached the requirements gathering by trying to understand the business processes for the organization and the interfaces needed. The interviewee referred to this as a "use case" method, but stated that she had used other methods of requirements gathering, including interviewing, JAD and RAD.

Another IS interviewee identified a different type of scenario when asked about previous experience with requirements gathering. While the IS interviewee mentioned above was working with a system that had already been developed outside of the corporation, this interviewee was involved in ongoing upgrades to an internally developed IS system. Users would submit requests for new functionality or enhancements and IS

would investigate the changes, their impact on the business processes, how the change would be implemented and the training required for the users. The changes made for the application were the responsibility of the IS team, and the changes needed for the business processes were the responsibility of the users. The interviewee stated that "…we were most successful in cases where we understood their current business process…we had a fairly static team that understood the clients and application well. I think that helped to be successful."

This interviewee also referred to the TS-3 project as "odd" because the application was already in existence. It appears that, while not unfamiliar with already developed application requirements gathering, this mode was less comfortable because IS personnel had to understand the application going into the requirements gathering activity. "There was a lot of blind leading the blind - trying to learn the application at the same time I'm trying to give guidance to the clients."

To summarize, of the IS interviewees, one had recent experience with a requirements gathering activity for an already developed system, in fact, the same system. In comparison, the other IS study participants' had experience with another type of requirements gathering - for a system that could be altered by IS.

Of particular interest from the discussion of IS experience is the mention of business processes. The first IS interviewee mentioned who had been involved with the initial implementation of TS-3 in the company noted IS involvement with the business processes, while another IS interviewee's experience was that business processes were the responsibility of the users. These differing experiences may have influenced the

approaches these individuals took and could have, in turn, impacted the users' perceptions of what was required of them during the requirements gathering for this project.

4.4 INITIAL APPROACH REQUIREMENTS PHASE

The Initial Approach Requirements Phase refers to the period of time between the beginning of requirements gathering for the three independent employee training groups in early 1998 and the point in time when the first client project manager was identified to oversee the project for the three groups as a collective prior to official consolidation of the groups.

4.4.1 Communication among participants

Throughout the course of this requirements gathering phase the communication roles and the expectations of those roles changed. During the early part of the requirements gathering in this phase, the IS team was dealing with representative users from three organizations and attempting to help the users consider changes to their processes which would allow for a smooth transition to the new system. See Figure 2 for an illustration of the communication flow during this phase. The approach was defined by the fact that "the application was already there - the biggest change we would have would be spanning the gap between the way our clients currently do business with their current application, and the way they would do business with [TS-3]." While the individual who later became the first client project manager was involved at this point, her involvement was only as a representative for one of these groups.

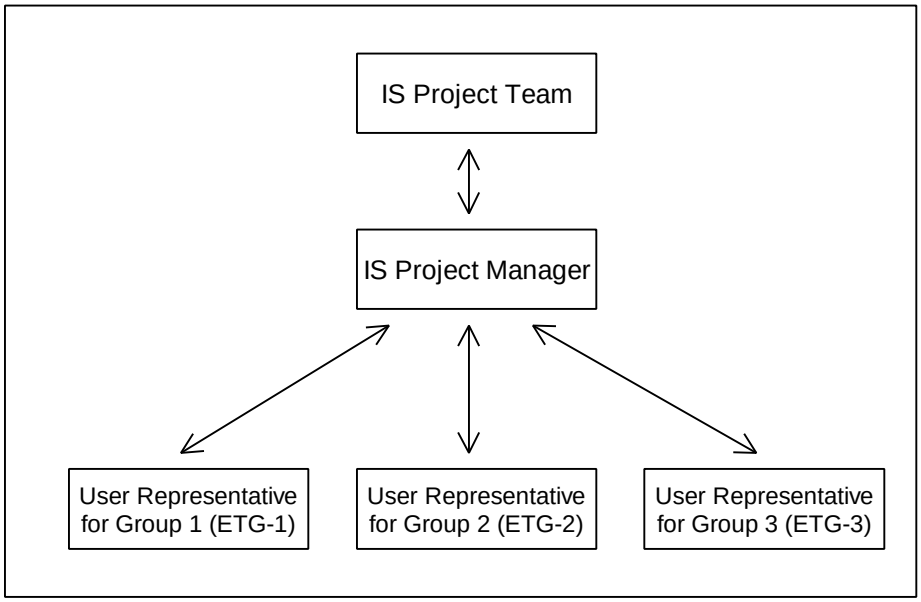

Figure 2: Initial Approach Requirements Phase Communication between IS and Users

One of the expectations that IS had was that the users would be able and willing to make decisions and initiate a compromise among the groups. An IS interviewee noted that there was not a single representative for all of the three groups. From the interviews, however, it is unclear why compromise and joint decision making was necessary. In the Initial Approach Requirements Phase, the intention was still to implement each of the three groups separately in succession. IS may have expected the users to adopt one set of business processes that were already aligned with the system processes, while the users still expected the system to conform to their organizations' needs. According to the interviewee, having one individual willing to make the final judgement on decisions would have helped during the requirements gathering process - "one of my expectations was that I would have a prime on the client side that would make some decisions. Unfortunately, I didn't really have that and I think that hurt the situation."

During this phase of the requirements gathering for the project, the expectations of IS were presented to the users through their interactions with IS at the time. Users described this process of IS information gathering as "probing questions" that they did not necessarily know how to answer. As one study participant explained, "I don't think we delivered what they expected or they had a lot of trouble…trying to dig out exactly what they needed from us." IS participants also reported some difficulties, claiming that "nobody understood the end to end process" i.e., the user representatives were not all knowledgeable of the full business processes and objectives in their individual organizations. Thus, IS personnel perceived the users did not have sufficient knowledge about their business processes, and were not willing to compromise and make decisions. The users, on the other hand, recognized they did not meet the IS staff's expectations and did not know why.

4.4.2 Educational activities

When asked what educational opportunities were provided, an IS interviewee involved in the Initial Approach Requirements Phase indicated that efforts were made by IS to educate the users. This education was offered during the kickoff meeting. Users were provided with information and materials on "gating" (IS processes around the design, development, implementation and acceptance of the system), what would be involved, what was expected, and how things were to be accomplished. This activity supports the direct communication flow in place at this point (see Figure 2). The expectation of the IS project manager was that IS "would get the understanding of the

[business] process as well as the requirements from the client; they [the user representatives] would feed it to the IS organization."

The users did recall educational opportunities that were provided to help them understand the requirements processes to be used. One user mentioned a meeting held where the steps to be taken throughout the project were outlined. The user indicated that she was encouraged by the information that was shared, but that she later felt that the project did not follow the plan that was presented. Another user discussed the availability of IS's project management website, which housed documentation related to this project and the previous implementation of the same application in the customer training organization, and his concern that the opportunities to learn from the development team were limited because of their workload - "there certainly wasn't much opportunity [to learn] from the people involved - like the development team - to learn from them…we were looking for some direction and they were saying, well, there's some stuff up on the web." Clearly, this was not a satisfactory response for the user.

IS also tried to provide education on the system itself during this early phase by installing the system on the users' computers and walking them through pieces of the application. This approach also facilitated the discovery of requirements directly, as the users would review the application and identify any missing functionality.

4.4.3 Perceptions about the requirements process

The users in this case arrived "at the table" with some preconceptions about what a requirements document would be and how it would be used. One user believed that the requirements document was something that should have been developed before the

application was selected, and therefore was of questionable value because the system had already been chosen. In addition, requirements gathering was "really difficult to do because of the fact that we didn't really understand how the system worked." This frustration was a recurrent theme for both users and the IS team; the system was and remained something of an unknown until late in the requirements gathering phases. The other users also had difficulty reconciling the fact that the system was already developed and in use and that they were being asked to identify requirements for it.

IS's stated objectives for the requirements gathering activities were not to define a new set of specifications on which to design and develop a new system. The goal of the requirements gathering was to identify the gaps between the functionality of the new system and those that were in use at the time so that processes used by the groups preparing to transition to the new system could be adjusted accordingly. The users recognized this as an IS goal at some level because one user recalled that "the big thing they [IS] were pushing at the time was to think outside the box and try to figure out a different way of doing things." However, while IS was attempting to get the users to consider different ways of managing their business, the users continued to provide requirements to IS that were based on their current processes and systems.

4.5 PRE CONSOLIDATION REQUIREMENTS PHASE

The Pre Consolidation Requirements Phase indicates the period of time between the identification of a client project manager to oversee the collective efforts of the requirements gathering for the consolidating groups and the time immediately after the consolidation of the three organizations. It should be noted that because the three

requirements phases discussed in this paper were delineated by the author, interviewee responses may not refer to all phases. The Pre Consolidation Requirements Phase data is relatively sparse because the client project manager from this phase was not interviewed and the only way to correlate interviewee responses to this period is when the client project manager is mentioned specifically.

4.5.1 Communication among participants

The client decision maker/project manager role appeared later in the requirements gathering timeline, and, although exactly when is not clear, it seems to have happened after consolidation planning had begun in the organizations. With the addition of this new role, the communication among participants changed slightly. (See Figure 3.) The consolidation activities made way for a combined approach; since the individual groups would become one, the project would come to be viewed as one implementation rather than three. While the assignment of the client project manager role was made, in all likelihood, to coincide with the consolidation, this action also was a step towards meeting IS expectations for one user contact point.

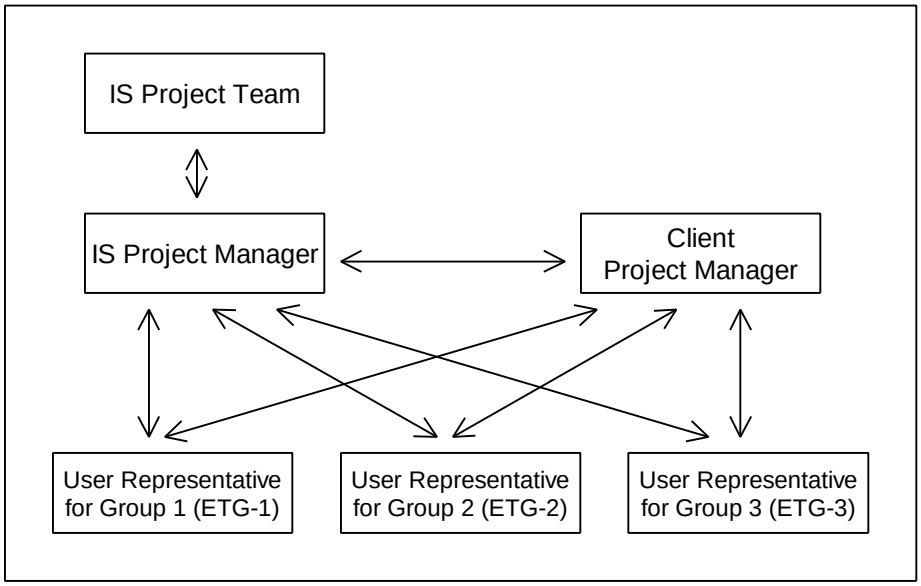

Figure 3: Pre Consolidation Phase Communication between IS and Users

Additionally, the users were looking to the client project manager for communication. One user stated that "I expected [the client project manager] to be our communicator of sorts as well," during this phase. It appears that this user, rather than go directly to the IS team, wanted - expected - to get answers to questions from the client project manager. This expectation became reality in the Post Consolidation Requirements Phase when the communication between IS and the users was accomplished through the client project manager. During the Pre Consolidation Requirements Phase, the IS project manager may have continued to interact with the individual user representatives even after the introduction of the client project manager because a pattern of direct interaction between IS and the users had already been established in the Initial Approach Requirements Phase. Changing the flow of communication in order to accommodate a new role may have been difficult for the users and/or IS, resulting in the communication pattern illustrated in Figure 3.

4.5.2 Educational activities

Educational activities specific to the pre-consolidation phase are unclear, but it is apparent that there was still substantial confusion around the requirements documentation and what it really meant. Users took it upon themselves to initiate communication and education to uncover what was being discussed. One user provided the following example of this:

> "I remember one meeting - I think this says it all - the requirements document was called about ten different things, we were on one teleconference and [the client project manager] wasn't on it and I started asking people, 'do you know what this means?' and nobody knew. Everybody was confused and nobody was asking the question 'does requirements document mean the same as system specifications?' I'm not using the right words now, but it was called three different things. I remember sending out an email that said 'help me' and I think I got some answers then but we were chugging right along at that point."

4.5.3 Perceptions about the requirements process

Although perceptions around the requirements process relating to this phase specifically were not identifiable from the interviewee responses to the interview questions, it is expected that the perceptions at this point were similar to those in the Initial Approach Requirements Phase.

4.6 POST CONSOLIDATION REQUIREMENTS PHASE

4.6.1 Communication among participants

After consolidation, there was no longer a need for individual organizational user representatives to discuss requirements. The focus could now turn to functional requirements for different areas of the larger consolidated group. As evidenced by IS interviewee responses, the education of and communication with the users was expected to flow from the IS project manager to the client project manager, who was then expected

to pass the information to the appropriate user representatives. In the Post Consolidation Requirements Phase, IS relied much more heavily on and expected the client project manager to communicate relevant information to the users regarding roles and responsibilities. As one IS team member explained, the "project manager or prime designated by the project manager would work with the primes [user representatives] to establish their roles." See Figure 4 below for an illustration of the communication flow during this phase of requirements gathering.

IS recognized that there could have been some loss of information in the flow from IS to client project manager to users and that the level of understanding may not have been at the level IS had intended;

> "we're working with the [client] project manager, and we're sharing some information and we didn't necessarily have control that the information would get to the person it pertained to - that the level of education was passed on in terms of exactly what we mean when we say requirements gathering."

This flow of information compared with the early information flow directly from the IS project manager to the users illustrates the changes in the communication which occurred during the requirements gathering. The introduction of an intermediary between IS and the users (the client project manager role) was something that IS had wanted since the Initial Approach Requirements Phase; however, the role did not necessarily provide the clear communication flow that was needed.

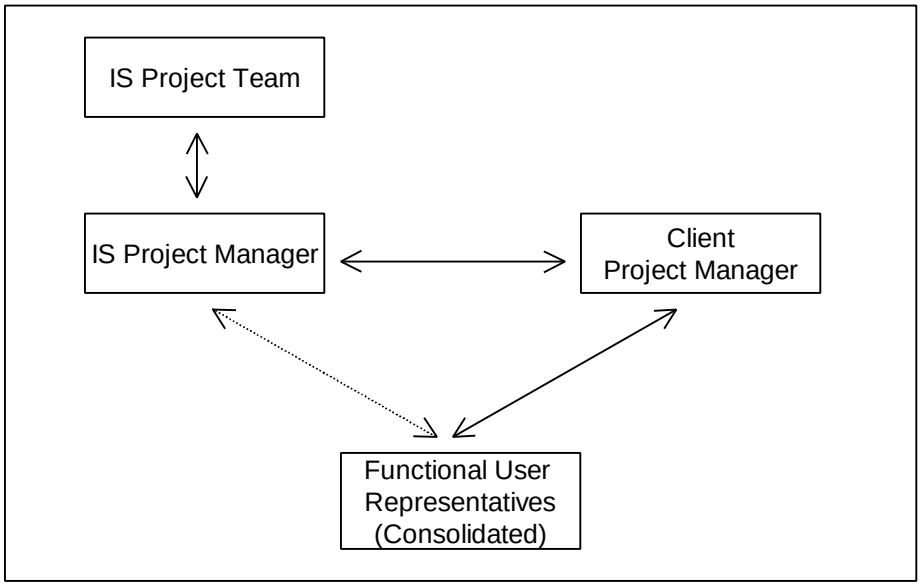

Figure 4: Post Consolidation Phase Communication between IS and Users

JAD (Joint Application Design) sessions were used in the Post Consolidation Requirements Phase to elicit specific requirements from the user representatives. The information gathered during these JAD sessions was then used as the primary and final documentation of user requirements for the implementation of TS-3 for the ETG-4 organization. The JAD sessions were the main requirements gathering activity during the Post Consolidation Requirements Phase and would have represented the main opportunity for interaction directly between IS and the user representatives. This relatively limited interaction is represented in Figure 4 with the dotted line between the IS Project Manager and the Functional User Representatives.

4.6.2 Educational activities

Educational activities offered at this phase were centered around helping the users understand the business processes which had been defined during the very first

implementation of TS-3 in the company, rather than to educate the users on IS processes. The TS-3 business processes were to be used as a baseline model for other TS-3 implementations in the company. The understanding of these business processes and their comparison to those currently used in the users' organization (ETG-4) would allow for an assessment of gaps between the TS-3 processes and the users' processes, and identification of uniquenesses in the users' processes. Those uniquenesses would then become the foundation for the requirements. While business process education was offered to the users, IS also "shared high level phases in terms of our methodology for deploying [ETG-4]." This communication concerning IS processes and activities was handled primarily through the regular publication of the updated project plans. Other discussions of IS processes were vaguely recalled by the interviewee, but no formal event occurred akin to the kickoff meeting in the Initial Approach Requirements Phase.

4.6.3 Perceptions about the requirements process

IS's expectations about what would be accomplished during this requirements gathering phase seems to be identical to their expectations in the earlier phases, i.e., their expectations appear to have remained steady throughout the three phases. Referring to the Post Consolidation Requirements Phase activities, and specifically the JAD sessions, an IS interviewee stated "the whole purpose of the JAD was to go through what was already fundamentally there and identify uniqueness."

Additionally, the application at the center of the implementation had to interface with other internal corporate systems to gather and disseminate data on a regular basis. The requirements for these interactions had to be identified in order for the system to be

able to properly support the users' business. IS's expectations of the users were that they would be knowledgeable of not only the processes which were internal to their organization, but also how those processes interfaced with other organizations, systems and processes - "there's a certain degree of knowledge that they [the users] need to know about the information they share outside of their own organization…"

As in the Initial Approach Requirements Phase, IS expected the users to be able to make decisions concerning their requirements. The users, however, were still working to make the newly consolidated ETG-4 organization work, and were basing requirements on their "old" groups' processes from before the consolidation. One example of this was a meeting between IS and two users who had both performed the same business process in their respective organizations prior to consolidation. The business process was different for each of the two groups and the final process had not yet been determined by the consolidated ETG-4 team, but IS wanted a decision on business process issues. The user did not feel comfortable providing this information, given the lack of definition on the process within the team. This lack of finality concerning the consolidated organization's own business requirements proved to be a topic that was frequently mentioned during the interviews. The user mentioned above indicated that she understood the job she was doing, but was not sure how it would fit into a totally different process.

4.7 PERCEIVED SUCCESS OF THE IMPLEMENTATION

The perceived success of the implementation was gathered through an interview question that asked each interviewee to rate the success on a scale of 1 to 5, 1 being not at all successful, and 5 being very successful. While no one rated the implementation a "1,"

none of the interviewees gave the implementation a high rating either. The user study participants gave the following implementation success ratings: between 2 and 3; 3; and 4 for TS-3 only, 2 for TS-3A. The IS study participants gave the implementation success ratings of 3, 3, and 2.

One particular item that surfaced in several of the interviewees' elaboration on the success rating was TS-3A. TS-3A was a component of TS-3 which allowed general end user access through the company's intranet via a web browser. ETG-3 had similar functionality with it's TS-2 system, and had made it clear from the beginning (Initial Approach Requirements Phase) that the same functionality was required of TS-3, necessitating the deployment of TS-3A. IS interviewees involved during the Initial Approach Requirements Phase also noted that the need for TS-3A was identified as a requirement at that point: "we knew prior to the April kickoff meeting [TS-3A] was a requirement for the [ETG-3] group…it was definitely a requirement."

Later in the requirements gathering process, during the Post Consolidation Requirements Phase, the requirement for TS-3A was appears to have been unintentionally overlooked. To the user organization, the underlying requirement was still there, but the specific identification of it had been excluded from the main requirements gathering activities of this phase - the JAD sessions. Regarding this, an IS participant said "had I to do it all over again, I would have included that in a JAD session." Because this requirement was not specifically identified and defined as part of the Post Consolidation Requirements Phase JAD sessions, difficulties arose around the delivery of TS-3A later in the implementation. TS-3A was implemented shortly after TS-3, but not without serious

end user impact, frustration for the ETG-4 organization and substantial effort by the IS team.

The case of TS-3A illustrates not only the importance of requirements, but also the importance of effective communication throughout the definition process, the need for users to understand what has and has not been identified as a requirement, and what their responsibilities are during the process of requirements definition. Other responses to the question of the TS-3 implementation's success included: "I'm not convinced it satisfied the business needs."; "It's in production, I assume at this point its satisfying a business need, I don't even know that it is fully."; "One thing about requirements definition is do you let your tool define your process, and that's what happened. So that's not successful at all." One participant went as far as to rate the TS-3 and TS-3A implementations separately, giving the TS-3 implementation a higher success rating than TS-3A. Though the definitions of "success" are subjective, the responses collected indicated that the success rating of the implementation is mediocre at best.

5. CONCLUSIONS AND FUTURE RESEARCH

From the data collected and analyzed, several observations related to user understanding of IS needs and expectations can be made.

1. Users with prior experience in similar projects and/or extensive involvement throughout the TS-3 project were or became more comfortable with the requirements gathering than those without prior experience or extensive involvement.

2. The changing communications flow between IS and the users that occurred because of the changing of personnel and/or introduction of new project related roles may have blurred the lines of responsibility concerning education of users, resulting in confusion around roles and purpose with respect to requirements gathering.

3. Because the system was already in existence and had been implemented in the company, the nature of this particular requirements gathering added to the confusion of users concerning the purpose and importance of the requirements gathering activities.

4. One of IS's goals throughout the entire process, from the Initial Approach Requirements Phase through the Post Consolidation Requirements Phase, was to assist the users in managing change to their business processes so they could use the system effectively upon implementation. Users expected the IS system to change to match their existing business needs and processes.

5. The fact that the three groups originally involved were identified for consolidation not long after the Initial Approach Requirements Phase began added another layer of complexity throughout as processes and roles changed.

Certainly, improved communication and additional user understanding would have enhanced the requirements gathering process, but to what degree is unknown without further investigation. Due to the exploratory nature of this paper, the limitations presented by the data collection methods and the small sample size, no direct correlation between user education on the requirements gathering and the success of the implementation was identified. It is clear that further research is warranted in this area to investigate the importance and value of user education. The limitations of this study suggest that a more comprehensive data collection approach including observation and interviewing during the requirements gathering phase would be advisable. By collecting data in this manner, the researcher may develop a more thorough understanding of educational interactions and their effect on the quality of the requirements gathering.

The research question addressed in this paper was conceived as a result of my own participation in the TS-3 project as the client project manager in the Post Consolidation Requirements phase and beyond. From this perspective, I was very involved in the project and did not have the opportunity to objectively assess what was happening around me. The study described in this paper allowed me to review the project from a distance and identify some key learnings regarding the implementation of TS-3 that can be to future projects: (a) users and IS must have the opportunity to educate *each other* on processes and expectations regarding both how they will work together and for the system they are

working to design, develop and implement - assumptions of understanding in either area easily lead to miscommunications that could jeopardize the success of the project; (b) the roles required for the project must be identified early and the responsibilities associated with those roles confirmed by both IS and user teams; and, (c) open, honest, clear communication between IS and the users, directly or indirectly, is essential for success. There is no substitute for good communication during the requirements gathering process.

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Appendix A : STUDY CONSENT FORM

Principal Investigator:	Jennifer A. Hoffman
Phone:	(910) 693-1464
Fax:	(910) 693-7915
Email:	hoffman_colling@hotmail.com
Project Title:	*User Understanding of I/S Needs and Expectations: Impact on Quality of Requirements and Satisfaction with System*

Overview

The purpose of this study is to determine whether user familiarity with system design and development methodologies impacts the quality of the requirements gathering process and the success of the system implementation. It is my hope that by interviewing individuals who were on the TNTS project team, I can investigate this issue and perhaps improve understanding between user and development teams in future systems projects.

Your Participation

To complete this study, I will be interviewing members of the TNTS user (NNET) project team and the TNTS development (I/S) project team. Each interview will be approximately two (2) hours in length, and will be conducted outside of normal business hours.

I have already obtained approval from Stephen Grant and Terry Conlon to proceed with the study, but you are not required to participate in any way. Neither of these individuals, nor any other member of management will be advised of or have access to records detailing who did or did not choose to participate or the data collected as a result of your participation. Only the final paper will be available for review.

Risks and Discomforts

I do not know of any personal risk or discomfort you will have from being in this study.

Confidentiality

- I will make every effort to protect your privacy.
- I will not use your name in any of the information I get from this study or in any of the research reports.
- Any information I get in the study will be recorded with a code number that will let me know who you are.
- When the study is finished, the key that shows which code number goes with your name will be destroyed.

- Because I will be making efforts to protect your privacy, I ask you to agree that I may use any information I get from this research study in any way I think is best for publication or education.

Your Rights

- You decide on your own whether or not you want to be in this study.
- If you decide to be in the study, you will have the right to stop being in the study at any time.

Institutional Review Board Approval

The Academic Affairs Institutional Review Board (AA-IRB) of the University of North Carolina at Chapel Hill has approved this study. If you have any concerns about your rights in this study, you may contact the Chair of the AA-IRB, David A. Eckerman, at CB#4100, 300 Bynum Hall, UNC-CH, Chapel Hill, NC 27599-4100, (919) 962-7761, email: aa-irb@unc.edu

Summary

I understand that this is a research study to determine the impact of user understanding of systems design and development methods on the success of the system implementation.

If I agree to be in this study, I will participate in a scheduled interview lasting no more than two (2) hours, to be conducted after business hours on a weekday or on a weekend. During the interview, I will be asked to discuss my participation as a member of the TNTS project team.

I ___ give / ___ do not give my consent for the investigator to audio tape-record the interview session.

I have had the chance to ask any questions I have about this study, and they have been answered for me.

I have read the information in this consent form, and I agree to be in the study. I will keep one copy of this form and provide the investigator with a copy or fax for her records.

Signature of Participant Date

Appendix B : INTERVIEW QUESTIONS/GUIDE

User Team Series	Development Team Series
Had you participated in a system implementation project(s) previously? Could you briefly describe it(them)?	Have you worked with users previously during the requirements phase of a project? Could you briefly describe this? Is there a reason it was used during this project? Was a specific model used (ETHICS, JAD, etc.)?
During the requirements gathering phase of the project, what do you feel was expected of you by the Development Team? How did you learn about their expectations? Were these expectations realistic? Did you meet these expectations? Why or why not? What were your expectations of the Development Team?	What were your expectations of the User Team members during the requirements gathering phase of the project? Did the users meet these expectations? Why or why not?
How comfortable were you with respect to your role in the requirements gathering phase of the project?	Were the roles of the users defined prior to their participation in the requirements gathering phase?
On a scale of 1 to 5 (1 being low level of contribution/productivity, 5 being high level of contribution/productivity), how much do you feel you contributed during the requirements gathering phase? Please explain your response.	On a scale of 1 to 5 (1 being low level of contribution/productivity, 5 being high level of contribution/productivity), how much do you feel the users, as a group, contributed during the requirements gathering phase? Please explain your response.
What would have increased your level of contribution/productivity during the requirements phase, in your opinion?	What would have increased the level of contribution/productivity of the users, as a group, during the requirements phase, in your opinion?
Were you provided any educational opportunities to become more familiar with the system design and development methods being used during the requirements phase?	Did you provide any educational opportunities to help the users, as a group or individually, to become more familiar with the system design and development methods being used during the requirements phase? Could you please describe/discuss these efforts?
Did you understand the tasks and activities involved in the requirements phase and their importance to the overall project at the time of your participation? How did you develop, or come to, this understanding?	Were efforts made to ensure that the users understood the tasks and activities involved during the requirements phase and their importance to the overall project at the time of their participation?
Did issues arise later during the implementation that should have, in your opinion, been identified during the requirements phase? Why do you feel they were not identified?	Did issues arise later during the implementation that should have, in your opinion, been identified during the requirements phase? Why do you feel they were not identified?
What was the most satisfying aspect, or incident, of the project? The most dissatisfying?	What was the most satisfying aspect, or incident, of the project? The most dissatisfying?
On a scale of 1 to 5 (1 being not at all successful and 5 being very successful), how successful do you feel the project was? What factors contributed to this level of success?	On a scale of 1 to 5 (1 being not at all successful and 5 being very successful), how successful do you feel the project was? What factors contributed to this level of success?